APPENDIX A
CLOSURE SCOPE OF WORK

YERINGTON MINE SITE
CLOSURE SCOPE OF WORK

PREPARED FOR:

ARCO ENVIRONMENTAL REMEDIATION, L.L.C.
307 EAST PARK STREET, SUITE 400
ANACONDA, MONTANA 59711

PREPARED BY:

BROWN AND CALDWELL
Carson City Nevada

TABLE OF CONTENTS

List of Figures

SECTION 1.0
INTRODUCTION

Atlantic Richfield Company has prepared this Closure Scope of Work (SOW) to close the Yerington Mine site. Site investigations presented in this SOW will provide the technical foundation for the development of a Final Permanent Closure Plan (FPCP) that will meet the closure objectives listed below. Site investigations (i.e., short-term actions) requested by the U.S. Environmental Protection Agency and the U.S. Bureau of Land Management have been incorporated into the applicable sections of this SOW.

The proposed site investigations will collect the data necessary to develop and evaluate closure alternatives. Site investigations and closure alternatives will be conducted and evaluated in the context of human health and ecological risk. Data collection activities will be tailored to provide information relevant to the development, evaluation and implementation of closure alternatives. Closure alternatives will be screened against the appropriate evaluation criteria.

1.1 Previous Site Investigations and Interim Closure Activities

Atlantic Richfield Company has previously taken steps to improve site conditions, protect human health and the environment and, most recently, to attempt to reach final site closure. These steps date back to 1985 and have been conducted under an Administrative Order by the Nevada Division of Environmental Protection – Bureau of Corrective Actions (NDEP), and are listed below:

- Installed and operated pumpback system to manage shallow groundwater from 1985 to the present;
- Implemented pumpback system improvements in 1998, 1999 and 2001 including the installation of six new pumpback wells, re-compaction of the evaporation pond in 1998 and the relining of two evaporation pond cells with high-density polyethylene liners;
- Monitoring of groundwater quality and groundwater elevations in approximately 23 wells in the area from 1985 to the present;

- Ongoing financial and technical support for NDEP site management activities since Arimetco abandoned operations at the site;
- Submittal of annual monitoring and operation reports;
- Submittal of a Shallow Groundwater Data Evaluation Report in 2000;
- Conducted hydropunch groundwater monitoring with cooperation by the U.S. Bureau of Land Management (BLM), NDEP, Lyon County and others in 1999;
- Provided financial support to NDEP to cap areas of red material disturbed by Arimetco that were observed as dust concerns on two different occasions; and
- Agreed to conduct the following site investigation activities (short-term actions) requested in 2001 by EPA and BLM:
    - Quarterly monitoring of specific wells;
    - Hydropunch sampling;
    - Domestic well sampling;
    - Evaluation of Wabuska Drain; and
    - Evaluation of EPA air pathway data and installation of a meteorological station.

1.2 Closure Objectives

Closure objectives at the Yerington Mine site are stated as follows:

- Containment and management of existing and potential future impacts to groundwater;
- Assessment and, if required, containment of fugitive dust;
- Address physical and chemical stability of all surface mine materials;
- Demonstration that mine closure units and affected off-site areas following closure and reclamation activities will not adversely affect human health or the environment; and
- Establishment of a compatible post-closure land use and related monitoring and maintenance plan.

The collection of the data specified within this SOW will allow for the development of a comprehensive FPCP that meets these closure objectives. The site conceptual model and Work Plans will incorporate the processes suggested by NDEP, BLM and EPA to achieve these closure

objectives. Ecological and human health risk, including exposure pathways and receptors, and post-closure land use will be considered during site conceptual model development and evaluated in the FPCP.

1.3 Site Location and Background

The Yerington Mine site is located approximately one mile west of the town of Yerington in Lyon County, Nevada (Figure 1). Beneficiation operations were conducted between 1953 and 1978 for oxide and sulfide copper ores extracted from the open-pit mine in the southern portion of the mine site. Waste rock and tailings areas exist to the north of the open pit. Waste rock areas exist to the south and north of the open pit. Evaporation ponds were also constructed at the site.

In 1989, Arimetco International expanded leaching operations in the southern, central and western portions of the site, which included the construction and operation of an electrowinning plant located near the mill area. Leach pads and solution ponds were also constructed in the oxide tailings areas and cover all but the northern end of the former unlined evaporation ponds.

1.4 Work Plans, Data Summary Reports and Closure Plans

Atlantic Richfield Company will develop and implement Work Plans to conduct site investigations at the Yerington Mine site for each site closure issue and mine closure unit identified in Tables 1 and 2, respectively. The distribution, review and approval process is anticipated to follow the process under development within the Memorandum of Understanding between the regulatory agencies. One or more Work Plans may be combined into a single Work Plan, as appropriate. All site investigations will be summarized in Data Summary Reports, which will provide the basis for a site-wide FPCP to be developed and submitted for approval prior to implementation. Prior to conducting site investigations, a Health and Safety Plan will be submitted for review and approval.

The FPCP will provide the basis for implementation of closure activities at the Yerington Mine site. The FPCP will address all surface units (e.g., evaporation ponds, leach pad, tailings and waste rock areas) and general site conditions (e.g., groundwater and air quality) including affected off-site areas. The FPCP will include site location and background information, a description of each mine closure unit, characterization data, the proposed method(s) necessary to achieve physical and chemical stability, and an implementation schedule for final closure activities. As necessary, treatability studies will be performed to support site closure. An evaluation of the potential risk to human health and the environment will be conducted within the FPCP. All proposed closure alternatives will be screened against the following criteria within the FPCP:

- Economic (cost);
- Long-term effectiveness and performance;
- Cost-effective reduction of toxicity, mobility and volume of constituents of concern;
- Overall protection of human health and the environment;
- Implementability;
- Short term impacts;
- Public acceptance;
- State acceptance; and
- Risk-based evaluation.

1.5 Closure and Reclamation

The intent of closure and reclamation at the site is to meet the objectives listed in Section 1.2. Appropriate closure and reclamation activities will be developed upon the evaluation of data collected pursuant to this Scope of Work. The data developed under this SOW, combined with the existing data, will be critical in the development, evaluation and implementation of closure and reclamation activities.

SECTION 2.0
SITE INVESTIGATION APPROACH

This section describes the approach to investigating the general site conditions and specific facilities at the Yerington Mine site. Proposed investigation activities and the rationale for the activities are provided in Tables 1 and 2. An evaluation of existing data will be conducted, and summarized in a Work Plan along with the details for the specific data collection activities. Collection of new data in support of mine closure will be implemented only after all pertinent information has been compiled and evaluated. Although not a site investigation activity, development of a Community Relations Plan is also included in Table 1 and described in this section.

Work Plan implementation and the results of site-specific and general site investigation activities will provide the technical basis for the FPCP. Physical and geochemical characteristics of each mine closure unit, and its hydrogeologic setting, will be evaluated in the context of the site closure objectives described above. If these investigations identify surface materials that have the potential to degrade waters of the State, or pose a risk to human health or the environment, then appropriate additional site characterization and/or mitigation or closure measures will be conducted to evaluate air pathways, surface water pathways and groundwater pathways. Ecological and human health risk will be assessed for identified sources, pathways and receptors. If a mine closure unit is shown to have no potential to degrade groundwater, or does not pose a threat to human health or the environment, no further investigations will be conducted.

Site investigation activities for mine closure units will be based upon the unit's type, operational history, material characteristics and/or hydrogeologic setting. The following site closure issues and mine closure units for the data review and/or site investigation process have been identified:

Table 1. Proposed Site Investigations at the Yerington Mine: Site Closure Issues

Site Closure Issue	Investigation Activities	Rationale for Investigation
Conceptual Site Model	Data review and discussion of site technical issues; evaluation of exposure pathways and potential receptors; definition of mine closure units.	To provide the basis for future site investigations, data quality objectives, and Work Plan development.
Fugitive Dust	Install Air Monitoring Station(s). Evaluate EPA air pathway data.	Evaluation of particulates and metals resulting from wind-blown dust and collection of baseline/background data.
Cover Materials Characterization	Collect soil samples for analyses; quantify soil volumes.	Suitable soils can be used to cap facilities to support closure and future land use.
Stormwater Management	Evaluate aerial topographic and ortho-photo data.	To aid the development of post-closure stormwater management.
Site Water Balance	Analyze existing meteorologic data (e.g., precipitation, evaporation).	Water balance data will support groundwater management and closure decisions.
Groundwater Conditions	Evaluate existing groundwater data and, if required, conduct hydropunch sampling and design additional monitor wells to collect water elevation and chemical data. Quarterly monitoring of specific wells. Evaluate background data.	Data to be used in the evaluation of hydrogeochemical conditions to support closure activities and improve understanding of constituents of concern in groundwater.
Wabuska Drain	Collection and evaluation of hydrologic and geochemical data.	Data to be used to evaluate water quality and ecological and human health risk.
Community Relations Plan	Establish criteria for Community Relations Plan.	Inform members of Yerington and surrounding communities of mine closure activities.

Table 2. Proposed Site Investigations at the Yerington Mine: Mine Closure Units

Mine Closure Unit	Investigation Activities	Rationale for Investigation
Waste Rock Area (south of pit)	Collect waste rock samples for geochemical and geotechnical analyses.	Data to be used to evaluate borrow source feasibility.
Yerington Pit and Pit Lake	Review existing pit lake hydrologic and geochemical data; review hydrogeologic data of the bedrock and alluvial groundwater flow system filling the pit.	Data to be used to identify data gaps and/or management alternatives.
Waste Rock and Tailings Area (north of pit)	Collect waste rock and tailings material samples for geochemical and geotechnical analyses.	Data to be used to evaluate facility closure options.
Mill Area and Precipitation Plant	Collect soil samples for geochemical analyses. Evaluate structures for closure.	Data to be used to support closure alternatives and evaluation of potentially affected soils.
Oxide Tailings Area	Collect samples for geochemical and geotechnical analyses.	Data to be used to evaluate closure options.
Sulfide Tailings Area	Collect samples for geochemical and geotechnical analyses.	Data to be used to evaluate closure options.
Arimetco Leach Pads and Process Components	Collect leached material (spent ore) samples for geochemical and geotechnical analyses. Evaluate structures for closure.	Data to be used to evaluate closure options.
Evaporation Ponds	Evaluate underlying soils and groundwater conditions.	Assess potential for groundwater impacts and optimization of existing pumpback system.

2.1 Conceptual Site Model

A conceptual site model will be developed that establishes the basis for subsequent Work Plans and site investigations. The conceptual model will further define mine closure units through mapping and field verification. Mine closure units are currently defined in Table 2, which can be modified as site investigations proceed. Identified units can be sub-divided or more units added through this process. The conceptual site model will evaluate migration and exposure pathways for surface water, groundwater and air potentially affected by the mine units, and identify potential on-site and off-site receptors in terms of ecological and human health risk. If site investigations indicate that off-site areas have been affected, then the off-site area will be evaluated by the Work Plan for that unit, including an assessment of possible human health or ecological risk.

The conceptual site model will also establish data quality objectives (DQOs) for the site investigations described in this section, and listed in Tables 1 and 2, to help focus data collection activities to collect appropriate data necessary to meet the stated closure objectives. Conceptual model development will include a review of relevant data and literature, a review of past and recent aerial photographs, and pertinent anecdotal information (e.g., interviews with former employees).

2.2 Fugitive Dust

Fugitive dust from existing surface facilities at the Yerington Mine site has been observed at certain times. An evaluation of existing meteorologic data in the vicinity of the site will be performed and, on the basis of the data review and empirical observations of fugitive dust sources, Atlantic Richfield will install one or more air monitoring stations. A Work Plan for fugitive dust air monitoring will be prepared and submitted for approval.

The air monitoring station(s) will be strategically located to provide an assessment of fugitive dust that exits the site property boundary. Parameters to be monitored and monitoring

intervals/schedule will be developed in the Work Plan. Atlantic Richfield Company will evaluate controls for fugitive dust sources based on the air monitoring data. Source control measures will be integrated with facility specific characteristics in support of site closure objectives.

Upon receipt from EPA, Atlantic Richfield Company will evaluate data collected by EPA on site visits conducted on April 25 and June 19, 2001. Based on this review, additional data collection requirements will be determined. In addition, Atlantic Richfield Company proposes to evaluate existing meteorologic data for the site and install one meteorological station. The meteorological station will be strategically located to provide useful meteorological data relevant to the site. Results of this investigation, including meteorological data, will be presented in the Data Summary Report.

2.3 Cover Materials Characterization

An evaluation of potential cover materials from alluvial borrow sources and from existing mine units for use in potential site closure activities will be conducted. Characterization of cover materials will include an inventory of available material type including volume estimates, the collection of representative samples, and laboratory analyses. Geotechnical analyses will include grain size, moisture content, density, compaction characteristics or other physical analyses. Geochemical analyses may include whole rock chemistry and agricultural parameters to assess the ability to support vegetation or other chemical analyses. Sampling locations, analytical parameters and methods will be specified within the Work Plan.

The locations, volume and geotechnical characteristics of suitable cover materials will be presented in a Data Summary Report. This information will be used to support site re-grading and closure designs.

2.4 Stormwater Management

Based on recent site aerial photography and topographic mapping (2-foot contours at a scale of 1 inch = 100 feet), an evaluation of the need to develop re-grading plans for stormwater management activities will be performed. As necessary, within the FPCP, stormwater management activities will be integrated with the closure objective of attaining physical and chemical stability for all mine closure units. Such activities will be supported by run-off calculations and site-specific meteorologic data.

2.5 Site Water Balance

Atlantic Richfield Company will evaluate existing meteorologic data (e.g., precipitation and evaporation) to determine the need to collect additional site-specific data. Existing and new data will be integrated with the cover designs and re-grading plans within the FPCP to manage stormwater run-off at the site. A comprehensive water balance database will also support management decisions for facility and overall site closure, including the optimization of groundwater pumping from the shallow aquifer. The meteorologic data will be compiled the FPCP, and will aid in the development of closure options.

2.6 Groundwater Conditions

An evaluation of current groundwater management operations and aquifer conditions in the context of site water balance information will be conducted including an assessment of the effectiveness of the pumpback well system. This review will include the identification of areas at the mine site, located down-gradient of surface features with the potential to impact groundwater, that have little or no groundwater monitoring data. The results of this evaluation will be summarized in a Work Plan that will present the locations and preliminary designs for additional monitor well construction. Piezometers may also be specified within the Work Plan to aid in evaluating groundwater elevations at certain locations. The monitoring schedule and analytical parameters for new and existing wells will also be included within the Work Plan. Separate Work Plans have already been submitted for hydropunch evaluation and trench testing

of groundwater conditions associated with the Pumpback Well System. However, other activities may be incorporated into the Work Plan in the future.

As part of site groundwater investigations, Atlantic Richfield Company will conduct quarterly sampling and analysis of specific constituents from groundwater monitor wells located within and down-gradient of the Yerington Mine site during four consecutive quarters. Details such as locations, analytical parameters, etc. will be specified within the Groundwater Conditions Work Plan. The purpose of this investigation is to provide more current groundwater quality data within and around the site, particularly in the shallow aquifer. The investigation will also provide additional data to aid in the evaluation of the effectiveness of the current Pumpback Well System. Data Summary Reports will be prepared pursuant to a yet-to-be selected regulatory mechanism that will provide the analytical results of this one-year investigation.

Additional monitor well installations may be implemented after a detailed review of existing hydrogeologic conditions and groundwater quality data from the existing monitor well network and the area down-gradient of the Pumpback Well System. As requested by EPA and BLM in the July 2001 General Notice Letter, two additional monitor wells are anticipated to be installed as Short-Term actions. One well will monitor groundwater from the area near the intersection of Locust Lane and Luzier Lane. The second well would replace an existing shallow aquifer monitor well, USGS-13, that is currently nested with a monitor well completed in a deeper aquifer.

In addition to the hydrogeologic investigations described above, Atlantic Richfield Company will also re-sample domestic wells from residences previously sampled by EPA at down-gradient locations from the Yerington Mine site. The sampling and analysis protocols, the list of analytical parameters and other details will be specified in the Groundwater Conditions Work Plan. Results of domestic well sampling and analysis activities will be presented in the Data Summary Report.

2.7 Waste Rock Area (South of Pit)

An estimate of the extent of waste rock materials will be conducted using available historical information. Materials characterization may include one or more of the following sequential steps: materials inventory and static testing. Characterization of waste rock materials will follow guidelines approved for the Work Plan for this mine closure unit.

Waste rock materials to be sampled and analyzed will be based on color, degree of oxidation, lithology, secondary mineralization, alteration intensity, and mineralogic characteristics. Representative samples will be collected and analyzed using the appropriate method. The physical and chemical stability of waste rock materials will be determined on the basis of: 1) surface run-off; 2) depth to groundwater; 3) hydrogeology; 4) geochemistry; and 5) water balance calculations or modeling. Additional investigation activities and/or closure measures to eliminate, or minimize, the potential to degrade waters of the State or otherwise pose a risk to human health or the environment would be incorporated in the FPCP.

2.8 Yerington Pit and Pit Lake

The Yerington Pit has penetrated the bedrock groundwater flow system and the alluvial flow systems, and the associated pit lake will be evaluated for potential impacts to groundwater and/or the potential to pose an ecological or human health risk. Specifically, the Nevada Administrative Code NAC 445A.429 states that "Bodies of water which are a result of mine pits penetrating the water table must not create an impoundment which has the potential to degrade the ground waters of the state or has the potential to affect adversely the health of human, terrestrial or avian life." An evaluation of existing data and the collection of additional data, if necessary, will aid in the development of closure and management alternatives for the pit lake.

2.9 Waste Rock Area (North of Pit)

An estimate of the extent of waste rock materials will be conducted using available historical information. This area includes leached materials and low-grade ore stockpiles. The intent of the materials mapping will be to provide the basis for materials sampling and analysis as the first

phase of facility characterization. If a complete delineation of specific material types is not possible, Atlantic Richfield Company will present assumptions as to the extent of material types to NDEP for approval prior to materials characterization. Materials characterization may include one or more of the following sequential steps: materials inventory and static testing.

Characterization of waste rock and tailings materials will be performed per guidelines specified in the Work Plan for this mine closure unit. Waste rock materials to be sampled and analyzed will be based on color, degree of oxidation, lithology, secondary mineralization, alteration intensity, and mineralogic characteristics. Representative samples will then be selected based on the relative proportions of material types and analyzed using the appropriate method. The physical and chemical stability of waste rock and tailings materials will be determined on the basis of: 1) surface run-off; 2) depth to groundwater; 3) hydrogeology; 4) geochemistry; and 5) water balance calculations or modeling. Additional investigation activities and/or closure measures to eliminate, or minimize, the potential to degrade waters of the State or otherwise pose a risk to human health or the environment would be incorporated in the FPCP.

2.10 Mill/Process Area and Precipitation Plant

Soils in the mill/process and precipitation plant areas will be characterized with respect to their potential to pose a risk to human health or the environment. These areas include on-site process buildings, ditches, tanks and vats. Generally, soils will be analyzed for whole rock chemical analyses. The soils characterization program will be used to support the final closure plan for the process areas.

The FPCP will identify buildings or equipment fixtures will be subject to demolition, cover and/or removal and disposal of debris. Beneficiation units that contain materials or significant material residues that may impact groundwater or pose a risk to human health will be inventoried, characterized and evaluated for closure alternatives (e.g., removal, isolation, or mitigation). Units that may have the potential to impact surface runoff may be subjected to additional characterization and/or closure options as necessary to eliminate or minimize potential impacts.

2.11 Oxide Tailings Area

An estimate of the extent of oxide tailings materials will be conducted using available historical information. The intent of the materials mapping will be to provide the basis for materials sampling and analysis as the first phase of facility characterization. Mapping of historic drainage ditches will be included. Materials characterization may include one or more of the following sequential steps: materials inventory and static testing.

Characterization of oxide tailings materials will be performed per guidelines specified in the Work Plan for this mine closure unit. Representative samples will be collected and analyzed using the appropriate method. The physical and chemical stability of oxide tailings materials will be determined on the basis of: 1) surface run-off; 2) depth to groundwater; 3) hydrogeology; 4) geochemistry; and 5) water balance calculations or modeling. Additional investigation activities and/or closure measures to eliminate, or minimize, the potential to degrade waters of the State or otherwise pose a risk to human health or the environment would be incorporated in the FPCP.

2.12 Sulfide Tailings Area

An estimate of the extent of sulfide tailings materials will be conducted using available historical information. The intent of the materials mapping will be to provide the basis for materials sampling and analysis as the first phase of facility characterization. Mapping of historic drainage ditches will be included. Materials characterization may include one or more of the following sequential steps: materials inventory and static testing.

Characterization of sulfide tailings materials will be performed per guidelines specified in the Work Plan for this mine closure unit. Representative samples will be collected and analyzed using the appropriate method. The physical and chemical stability of sulfide tailings materials will be determined on the basis of: 1) surface run-off; 2) depth to groundwater; 3) hydrogeology; 4) geochemistry; and 5) water balance calculations or modeling. Additional investigation activities and/or closure measures to eliminate, or minimize, the potential to degrade waters of

the State or otherwise pose a risk to human health or the environment would be incorporated in the FPCP.

2.13 Arimetco Leach Pads and Process Components

As required, the spent ore materials contained within the Arimetco leach pads will be evaluated in a similar fashion as the tailings and waste rock facilities described above. Atlantic Richfield Company will prepare a Work Plan that outlines such characterization steps as the performance of static and kinetic tests, analysis of whole rock geochemistry, and the collection hydraulic parameters of pad materials. Given that these facilities are lined, and should not have significant potential to degrade waters of the State, a limited materials characterization program is anticipated. Process components associated with the leach pads such as ponds, ditches, tanks, the electrowinning facility, etc. will also be investigated. Hydraulic modeling of one or more representative pads may be conducted to demonstrate the long-term water balance for these facilities.

2.14 Evaporation Ponds

The unlined evaporation pond has resulted in mining-related groundwater issues within the Yerington Mine site, and is subject to the AO resulting in the Pumpback Well System. Other lined and unlined ponds, and historic drainage ditches, will be evaluated for potential impacts to human health and the environment. Representative samples of solids accumulated in the ponds will be analyzed in a similar fashion as performed for the tailings and waste rock areas. Collection of these data will aid in the development of closure options for the ponds.

2.15 Wabuska Drain Evaluation

Contingent upon receiving access from property owners and Work Plan approval, Atlantic Richfield Company will conduct a hydrologic and geochemical assessment of the Wabuska Drain. Up to four monitoring locations will be identified for flow measurements and the collection of surface water samples and soil samples for laboratory analysis. Details such as

sample locations, analytical parameters, etc. will be included in the Work Plan for this mine closure unit. Results of this investigation will be presented in a Data Summary Report.

2.16 Community Relations Plan

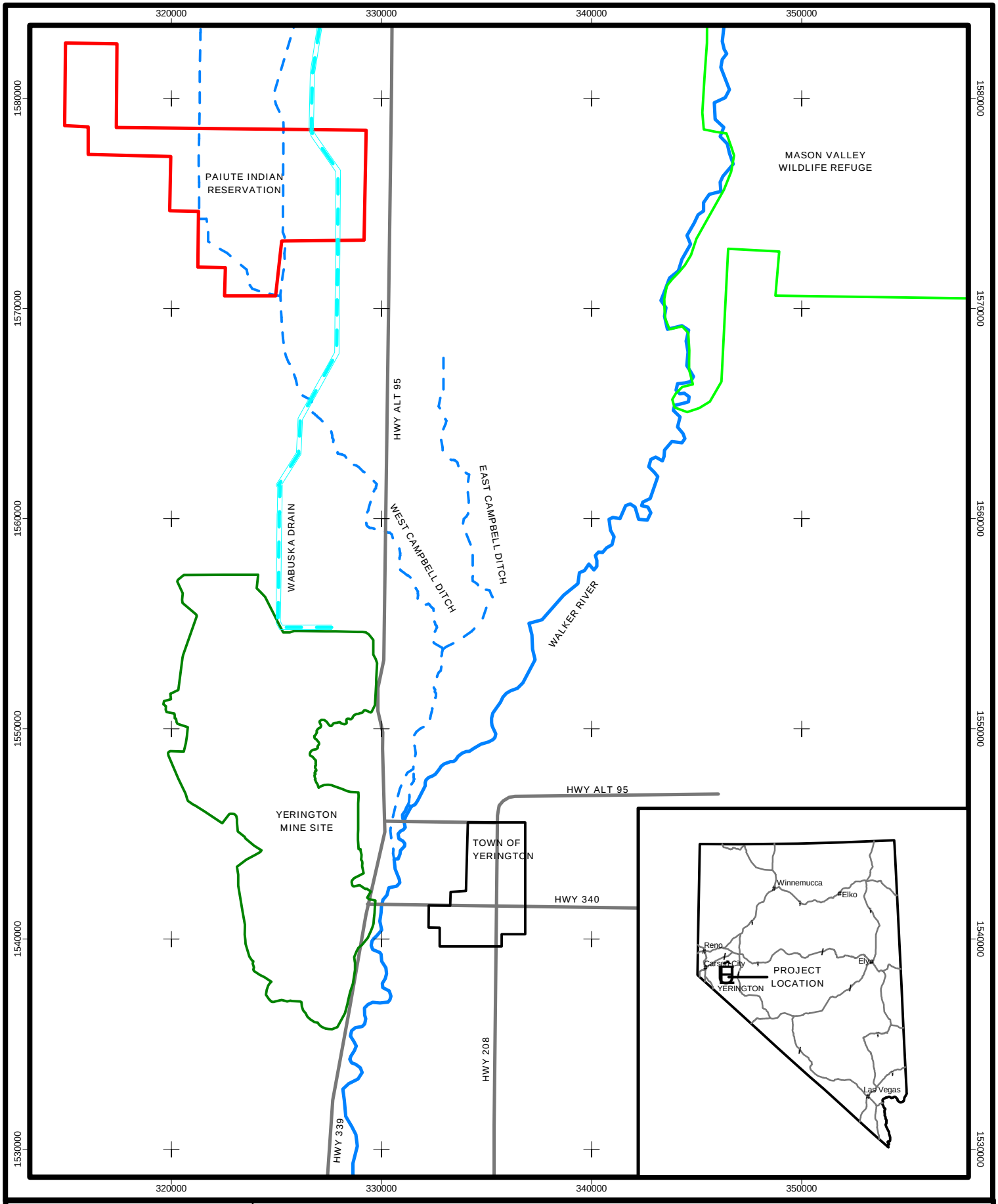
The YTWG will develop a community relations plan to provide local residents and communities with up-to-date information regarding the results of site characterization activities and closure plans for the Yerington Mine site. This plan will provide for distribution of printed information and conduct of public meetings in Yerington.

SECTION 3.0
SCHEDULE OF SITE INVESTIGATION ACTIVITIES

Atlantic Richfield Company plans to initiate these SOW activities at the Yerington Mine site in 2002. A preliminary schedule of Work Plan development is attached. This preliminary schedule is subject to modification as investigations proceed. EPA and BLM requested in the July 2001 General Notice Letter that certain "Short Term" actions be conducted as soon as possible. These Short Term actions are listed below and are being implemented on an accelerated schedule as specified in Atlantic Richfield's letter response dated February 5, 2002. However, the following Short Term actions have been included in the appropriate sections of this SOW, and are anticipated to be folded within the SOW activities as they get underway:

- Site-wide quarterly groundwater monitoring consisting of the existing groundwater wells on and near the site;
- Installation of at least two monitoring wells in the north and northwest site boundary areas;
- Bi-annual domestic groundwater well sampling of wells previously sampled by EPA;
- Sampling of the Wabuska Drain; and
- Evaluation of EPA air pathway data and installation of a meteorological station.

FIGURE



NOTES:
1.) PROJECTION: NEVADA STATE PLANE, WEST ZONE
1927 NORTH AMERICAN DATUM (FEET)

BROWN AND CALDWELL
Carson City, Nevada

DATE: DECEMBER 2002
Atlantic Richfield Company
PROJECT NUMBER: 21243

SCALE:
2000 0 2000 4000 Feet
1:72000

N

FIGURE 1
SITE LOCATION

P:\ARCO\21243\(TASK)\WP\DRAFT\Figures\FIGURE_1